

Multiple logical names may be assigned to the same printer number.

Unlike the output destination (see below), *logical-printer-name=n* is evaluated at *compilation time* and therefore independent of the program control flow.

The following topics are covered:

- Printers under OS/390 with Access Method AM=STD - Standard Batch
- Printers under VM/CMS with Access Method AM=STD - Standard Batch
- Printers under BS2000/OSD with Access Method AM=STD - Standard Batch
- Printers under Com-plete
- Printers under Com-plete (SMARTS)
- Printers under Natural Advanced Facilities
- Additional Reports

Printers under OS/390 with Access Method AM=STD - Standard Batch

- Logical Dataset Names
- Physical Dataset Names
- HFS File
- JES Spool File Class
- NULLFILE
- Allocation and De-Allocation of Datasets
- Print Files in Server Environments

Under OS/390, for a printer number that is defined with access method AM=STD (either automatically in the JCL or in the NTPRINT macro of the Natural parameter module or with the dynamic profile parameter PRINT), you can use *operand1* to specify a logical or a physical dataset name to be assigned to that printer number.

In this case, *operand1* can be 1 to 253 characters long and can be one of the following:

- a logical dataset name (DD name, 1 to 8 characters);
- a physical dataset name of a cataloged dataset (1 to 44 characters), or a physical dataset member name (1 to 44 characters for the dataset name, plus 1 to 8 characters in parentheses for the member name);
- a path name and member name of an HFS file (1 to 253 characters) in an MVS UNIX Services environment;
- a JES spool file class;
- "NULLFILE" (to indicate a dummy dataset).

Logical Dataset Names

For example:

```
DEFINE PRINTER (21) OUTPUT 'SYSPRINT'
```

The specified dataset must have been allocated before the DEFINE PRINTER statement is executed.

The allocation can be done via JCL, CLIST or dynamic allocation (SVC 99). For dynamic allocation you can use the user exit USR2021 in library SYSEXT.

The dataset name specified in the DEFINE PRINTER statement overrides the name specified with the subparameter DEST of the NTPRINT macro or PRINT profile parameter.

Optionally, the dataset name may be prefixed by "DDN=" to indicate that it is a DD name and to avoid name conflicts with additional reports. For example:

DEFINE PRINTER

Printers under OS/390 with Access Method AM=STD - Standard Batch

DEFINE PRINTER (22) OUTPUT 'DDN=SOURCE'

Physical Dataset Names

For example:

```
DEFINE PRINTER (23) OUTPUT 'TEST.PRINT.FILE'
```

The specified dataset must exist in cataloged form. When the DEFINE PRINTER statement is executed, the dataset is allocated dynamically by SVC 99 with the current DD name and option DISP=SHR.

If the dataset name is 8 characters or shorter and does not contain a period ".", it might be misinterpreted as a DD name. To avoid this, prefix the name with "DSN=". For example:

```
DEFINE PRINTER (22) OUTPUT 'DSN=PRINTXYZ'
```

If the dataset is a PDS member, you specify the PDS member name (1 to 8 characters) in parentheses after the dataset name (1 to 44 characters). For example:

```
DEFINE PRINTER (4) OUTPUT 'TEST.PRINT.PDS(TEST1)'
```

If the specified member does not exist, a new member of that name will be created.

HFS File

For example:

```
DEFINE PRINTER (14) OUTPUT '/u/nat/rec/test.txt'
```

The specified path name must exist. When the DEFINE PRINTER statement is executed, the HFS file is allocated dynamically. If the specified member does not exist, a new member of that name will be created.

For the dynamic allocation of the dataset, the following OS/390 path options are used:

```
PATHOPTS=(OCREAT,OTRUNC,ORDWR)
  PATHMODE=(SIRUSR,SIWUSR,SIRGRP,SIWGRP)
  FILEDATA=TEXT
```

When an HFS file is closed, it is automatically de-allocated by OS/390 (regardless of the setting of the subparameter FREE in the NTPRINT macro or PRINT profile parameter).

JES Spool File Class

To create a JES spool dataset, you specify SYSOUT=x (where x is the desired spool file class). For the default spool file class, you specify SYSOUT=*

Examples:

```
DEFINE PRINTER (10) OUTPUT 'SYSOUT=A'
  DEFINE PRINTER (12) OUTPUT 'SYSOUT=*'
```

To specify additional parameters for the dynamic allocation, use the user exit USR2021 in library SYSEXT instead of the DEFINE PRINTER statement.

NULLFILE

To allocate a dummy dataset, you specify NULLFILE as *operand1*:

```
DEFINE PRINTER (n) OUTPUT 'NULLFILE'
```

This corresponds to the JCL definition:

```
// DD-name DD DUMMY
```

Allocation and De-Allocation of Datasets

When the DEFINE PRINTER statement is executed and a physical dataset name, HFS file, spool file class or dummy dataset has been specified, the corresponding dataset is allocated dynamically. If the logical print file is already open, it will be closed automatically, except when the profile parameter CLOSE=FIN has been specified, in which case an error will be issued. Moreover, an existing dataset allocated with the same current DD name is automatically de-allocated before the new dataset is allocated. Print files that are to be allocated dynamically have to be predefined in the Natural parameter module with AM=STD.

To avoid unnecessary overhead by unsuccessful premature opening of print files not yet allocated at the start of the program, print files should be defined with the subparameter OPEN=ACC (open at first access) in the NTPRINT macro or PRINT profile parameter.

In the case of an HFS file, or a print file defined with the subparameter FREE=ON in the NTPRINT macro or PRINT profile parameter, the print file is automatically de-allocated as soon as it has been closed.

As an alternative for the dynamic allocation and de-allocation of datasets, the user exit USR2021 in library SYSEXT is provided. This user exit also allows you to specify additional parameters for dynamic allocation.

Print Files in Server Environments

In server environments, errors may occur if multiple Natural sessions attempt to allocate or open a dataset with the same DD name. To avoid this, you either specify the print file with subparameter DEST=* in the NTPRINT macro or PRINT profile parameter, or you specify OUTPUT '**' in the DEFINE PRINTER statement; Natural then generates a unique DD name at the physical dataset allocation when the first DEFINE PRINTER statement for that print file is executed.

All print files whose DD names begin with "CM" are shared by all sessions in a server environment. A shared print file is opened by the first session, and is physically closed when the server is terminated. For further information, see the section Natural as a Server in the Natural Operations for Mainframes documentation.

Printers under VM/CMS with Access Method AM=STD - Standard Batch

Under VM/CMS, for a printer number that is defined with the access method AM=STD (either automatically in the JCL or in the NTPRINT macro of the Natural parameter module or with the dynamic profile parameter PRINT), you can use *operand1* to specify a logical or a physical dataset name to be assigned to that printer number.

For this, the same applies as under OS/390 (see Printers under OS/390 with Access Method AM=STD - Standard Batch), but with the following differences:

- Instead of dynamic allocation via MVS SVC 99, the CMS command FILEDEF is used to define a dataset.
- HFS files are not supported.
- JES spool classes are not supported.
- In addition, the following syntax is used:

```
DEFINE PRINTER (n) OUTPUT ('fname ftype fmode (options)')
```

This generates the CMS command:

```
FILEDEF ddname-n DISK fname ftype fmode (options)
```

- Moreover, the following syntax is allowed:

```
DEFINE PRINTER (n) OUTPUT ('FILEDEF=filedef-parameters')
```

This generates the CMS command:

```
FILEDEF ddname-n =filedef-parameters
```

Printers under BS2000/OSD with Access Method AM=STD - Standard Batch

Under BS2000/OSD, for a printer number that is defined with the access method AM=STD (whether automatically in the JCL, in the NTPRINT macro of the Natural parameter module or dynamically using the profile parameter PRINT), you can use *operand1* to specify a file name, link name or system file that is allocated to this printer number.

In this case, *operand1* can have a length of from 1 to 253 characters and one of the following meanings:

- a BS2000/OSD link name (1 to 8 characters)
- a BS2000/OSD file name (9 to 54 characters)
- a generic BS2000/OSD file name (wildcard)
- a BS2000/OSD file name and link name
- a generic BS2000/OSD file name and link name (wildcard)
- the logical BS2000/OSD system file **SYSLST**
- the logical BS2000/OSD system file **SYSLST** (or **SYSLSTnn**, nn=01-99)
- the logical BS2000/OSD system file **SYSLST** (**SYSLSTnn**) with allocation to a file name
- the logical BS2000/OSD system file **SYSLST** (**SYSLSTnn**) with allocation to a generic file name (wildcard)
- *DUMMY

The following rules apply:

1. File name and link name can be specified as positional parameters or keyword parameters. The corresponding keywords are **FILE=** and **LINK=**. Mixing positional and keyword parameters is allowed but not recommended.
2. A string with a length of 1 to 8 characters without commas is interpreted as a link name. This notation is compatible with earlier versions of Natural.

Example:

```
DEFINE PRINTER (1) OUTPUT 'P01'
```

The corresponding definition with a keyword parameter is:

```
DEFINE PRINTER (1) OUTPUT 'LINK=P01'
```

3. A string of of 9 to 54 characters without commas is interpreted as a file name.

Example:

```
DEFINE PRINTER (2) OUTPUT 'NATURAL31.TEST.PRINTER02'
```

The corresponding definition with a keyword parameter is:

```
DEFINE PRINTER (2) OUTPUT 'FILE=NATURAL31.TEST.PRINTER02'
```

4. The following input is interpreted without considering the length and therefore forms exceptions to Rules 2 and 3:

- keyword input: LINK=, FILE=
- *DUMMY
- NULLFILE (equivalent to *DUMMY)
- *
- *,*
- SYSOUT
- SYSLST or SYSLST(*nn*)

Example: DEFINE PRINTER (7) OUTPUT 'FILE=Y' is a valid file allocation and not a link name, although the string of characters contains fewer than 9 characters.

5. Generic file names are formed as follows:

pnn.userid.tsn.date.time.number

where

nn	is a report number
userid	is a Natural user-ID, 8 characters
tsn	is the BS2000/OSD TSN of the current task, 4 digits
date	is DDMMYYYY
time	is HHISS
number	is a sequential number, 5 digits

6. Generic link names are formed as follows:

NPFnnnnn

nnnnn is a 5-digit number that is increased by one after every generation of a dynamic link name.

7. Changing the file allocation for a printer number causes an implicit CLOSE of the print file allocated so far.

You are strongly recommended, in all cases except when you only specify a link name (for example: P01), to work with keyword parameters. This avoids conflicts of names with additional reports and is essential for file names with fewer than 9 characters.

Examples:

```
DEFINE PRINTER (1) OUTPUT 'LINK=SOURCE'
  DEFINE PRINTER (1) OUTPUT 'FILE=SOURCE'
  DEFINE PRINTER (1) OUTPUT 'SOURCE'
```

Link Name

Example:

```
DEFINE PRINTER (1) OUTPUT 'LINKP01'
```

means the same as

```
DEFINE PRINTER (1) OUTPUT 'LINK=LINKP01'
```

A file with the LINK 'LINKP01' must exist at runtime. This can be created either using JCL before starting Natural or by dynamic allocation from the current application. For dynamic allocation, the user exit USR2029 in the library SYSEXT can be used. If, before execution, the link was active as a destination to another file, for example: 'P01', this will be released or retained depending on the value of the profile parameter FREE (possible values are ON and OFF). Release is done via an explicit RELEASE call to the BS2000/OSD command processor.

File Name

Example:

```
DEFINE PRINTER (2) OUTPUT 'NATURAL31.TEST.PRINTER02'
```

means the same as

```
DEFINE PRINTER (2) OUTPUT 'FILE=NATURAL31.TEST.PRINTER02'
```

The file specified in *operand1* is set up using a FILE macro call and inherits the link name that was valid for the corresponding print file before execution of the DEFINE PRINTER statement.

Generic File Name

Example:

```
DEFINE PRINTER (21) OUTPUT '*'
```

means the same as

```
DEFINE PRINTER (21) OUTPUT 'FILE=*'
```

A file with a name created according to Rule 4 is set up using a FILE macro call and inherits the link name that was valid for the corresponding print file before execution of the DEFINE PRINTER statement.

```
DEFINE PRINTER (22) OUTPUT 'FILE=*,LINK=GENFLK22'
```

A file with a name created according to Rule 4 is set up with the specified link name using a FILE macro call.

File Name and Link Name

Example:

```
DEFINE PRINTER (11) OUTPUT 'NATURAL31.TEST.PRINTER11,LNKP11'
```

means the same as

```
DEFINE PRINTER (11) OUTPUT 'FILE=NATURAL31.TEST.PRINTER11,LINK=LNKP11'
```

which means the same as

```
DEFINE PRINTER (11) OUTPUT 'FILE=NATURAL31.TEST.PRINTER11,LNKP11'
```

The file specified in *operand1* is set up with the specified link name using a FILE macro call and allocated to the corresponding printer number.

Generic File Name and Link Name

Example:

```
DEFINE PRINTER (27) OUTPUT '*,*'
```

means the same as

```
DEFINE PRINTER (27) OUTPUT 'FILE=*,LINK=*'
```

A file with a file name and link name created according to Rule 4 and Rule 5 is set up using a FILE macro call and allocated to the specified printer number (27).

Note:

When file name and link name are specified, the previous link name is not released, regardless of the value of the profile parameter FREE.

System File SYSOUT

Example:

```
DEFINE PRINTER (14) OUTPUT 'SYSOUT'
```

Report 14 is written to SYSOUT.

Note:

Under TIAM, SYSOUT is by default output on the screen.

System File SYSLST

Example:

```
DEFINE PRINTER (15) OUTPUT 'SYSLST'
```

Report 15 is written to the system file SYSLST.

System File SYSLSTnn - nn=01,...,99

Example:

```
DEFINE PRINTER (16) OUTPUT 'SYSLST16'
```

Report 16 is written to the system file SYSLST16.

System File SYSLST - nn - with Implicit Allocation to a BS2000/OSD File

Examples:

```
DEFINE PRINTER (11) OUTPUT 'SYSLST=LST.PRINTER11'
```

The system file SYSLST is allocated to the file LST.PRINTER11; Report 11 is written to the system file SYSLST.

```
DEFINE PRINTER (13) OUTPUT 'SYSLST13=LST.PRINTER13'
```

The system file SYSLST13 is allocated to the file LST.PRINTER13; Report 13 is written to the system file SYSLST13.

```
DEFINE PRINTER (19) OUTPUT 'SYSLST19=*'
```

The system file SYSLST19 is allocated to a file with a name generated according to Rule 4; Report 19 is written to the system file SYSLST19.

Printers under Com-plete

For Natural users under Com-plete, any printer name can be assigned, even if it has not been defined to Natural.

Printers under Com-plete (SMARTS)

For Natural users under Com-plete (SMARTS AM=SMARTS), any printer name can be assigned, even if it has not been defined to Natural.

For example:

```
DEFINE PRINTER (14) OUTPUT '/nat/path/printer'
DEFINE PRINTER (14) OUTPUT '/nat/path/printer/file/'
DEFINE PRINTER (14) OUTPUT 'printer'
```

It depends on the MOUNT_FS parameter of SMARTS whether the file is located on a SMARTS portable file system or on the native file system. The first element of the path (/nat/) determines the target file system.

If the string is terminated with a slash "/", the last element is taken as the name of the print file. Otherwise, the name of the file is generated from the UserID and a sequence number. If the string does not start with a slash, the path of the file is taken from the environment variable \$NAT_PRINT_ROOT.

The specified path name must exist. When the DEFINE PRINTER statement is executed, the file is allocated dynamically. If the specified member does not exist, a new member of that name will be created.

Printers under Natural Advanced Facilities

For Natural Advanced Facilities users, the name of any predefined logical printer profile can be specified. This logical printer profile need not belong to the currently active user profile. It may be any logical printer profile defined on the NATSPOOL file. It will be active only for the duration of the Natural program which contains the DEFINE PRINTER statement. For more information, see the Natural Advanced Facilities documentation.

Additional Reports

Additional reports can be assigned for default with the following names:

Report	Mainframes Only Y/N?	Function
BROADCAST	Y	Output message line to a TP monitor terminal. Same function as MESSAGE (see below), except that under Complete, the message is not sent to the desired terminal until no transactions are active on that terminal.
CCONTROL	Y	CCONTROL is the name of a special printer control table associated to the printer "n-1"; it must not be modified. For further information, refer to Printer-Advance Control Characters in the Natural Operations for Mainframes documentation.
CONNECT	Y	Output into a Connect folder. Note for Natural installation: the NATPCNT module of Natural must be linked to the Natural nucleus.
DUMMY	N	Output to be deleted.
HARDCOPY	Y	Output to the current hardcopy device.
INCORE	Y	Output into the NSPF incore database.
INFOLINE	N	Output to the Natural infoline. For details on the infoline, see the Natural terminal command %X in the Natural Reference documentation.
MESSAGE	Y	Output message line to a TP monitor terminal. The first 8 bytes of a message must contain the target terminal id. TSO and CMS require the user id instead of the terminal id. An example program MSGSW is supplied in the library SYSEXTP.
SOURCE	N	Output to the Natural source area.
WORKPOOL	Y	Output into the Natural ISPF workpool.

OUTPUT *operand1*

With *operand1*, you specify the destination within the online spooling system. The destination is evaluated at *runtime*.

If *operand1* is a variable, its length must be at least 8.

Any logical printer name may be assigned, provided that it has been defined in the parameter file/parameter module used, or via parameters or JCL during startup of Natural.

Under UNIX and Windows, the name must be specified as *LPTnn*, where *nn* may be 1 to 31.

Example:

LPT12 (UNIX or Windows printer name)

CMprt01 (OS/JCL DDNAME)

P01 (BS2000/OSD file command)

TID111 (Com-plete printer name)

PCPRNT01 (printer defined for Natural Connection)

Assignment Algorithm on Mainframes

To assign the OUTPUT destination name to a report number, an algorithm is executed which works identical for all access methods (as defined with the AM=xxx parameter of the NTPRINT macro).

This algorithm scans the list of printers defined to NATURAL (as it is displayed by the SYSFILE Print File Information screen) to find a name which matches the OUTPUT destination name. During this scan, the access method of the related logical printer is **not** taken into account.

If a matching name is found, the logical printer of this destination is used to spool the report. The SYSFILE output, however, will not be changed, i.e., this routing is internal only and not visible to the user.

If a matching name is **not** found, the logical printer of the LAST entry in the list of defined printers is used to spool the report. In this case, the logical printer name will physically be overwritten. The SYSFILE output reflects this change.

If the OUTPUT clause is omitted, the destination depends on the "Device Assignment" in the parameter file used; on mainframe computers, it depends on the profile parameter PRINT or macro NTPRINT respectively (see the corresponding Natural Installation or Natural Operations documentation).

PROFILE/FORMS/NAME/DISP/CLASS/COPIES/PRTY

With these clauses, you can provide printing control information to be interpreted by the spooling system of the TP monitor or operating system respectively.

Note:

The clauses FORMS, NAME, DISP, CLASS, COPIES and PRTY can only be used on mainframe computers.

You can specify one or more of these clauses, but each of them only once.

PROFILE

With the PROFILE clause, you specify as *operand2* the name of a printer control characters table. Such a table is defined under Windows and UNIX in the configuration file NATCONF.CFG. See the section for more details on how to set printer profiles.

On mainframe computers, you define the printer control characters table in the NTCCTAB macro respectively (as described in your Natural Installation or Operations documentation).

Note:

With Natural Advanced Facilities, the NTCC table can be maintained online (as described in the Natural Advanced Facilities documentation).

With the other clauses, you can provide values for parameters of the TP monitor's spooling system:

FORMS	Form
NAME	Listname
DISP	Disposition
CLASS	Spool class
COPIES	Number of copies
PRTY	Listing priority (1 - 255)

Those clauses will only use the default values for the first execution.

If one of the clauses listed above was defined once for a certain output, a subsequent DEFINE PRINTER statement with the same output and without this clause will use this definition. If the previous definitions are not clear in a Natural environment, Software AG recommends to set them in each module using DEFINE PRINTER statement.

For the PROFILE, FORMS and NAME clauses, the maximum length allowed for *operand2* is 8; for the DISP clause, its maximum length is 4; for the CLASS clause, its length has to be 1.

For the DISP clause, the possible values for *operand2* are "DEL", "HOLD", "KEEP" and "LEAV". If the DISP clause is omitted (or incorrectly specified), "DEL" applies by default.

Operand3 and *operand4* must be integer values.

Default values can be set with the corresponding subparameters of the profile parameter PRINT.

Example 1

```
DEFINE PRINTER (1) OUTPUT 'TID100'  
WRITE (1) 'PRINTED ON PRINTER TID100'  
END
```

Example 2

```
DEFINE PRINTER (REPORT1 = 1) OUTPUT 'LPT1'  
WRITE (REPORT1) 'REPORT1 PRINTED ON PRINTER LPT1'  
END
```

Example 3

```
DEFINE PRINTER (REPORT1 = 1) /* NO 'OUTPUT'  
WRITE (REPORT1) 'DEPENDS ON NATPARM SETTING OR JCL IN BATCH'  
                'OR ''PRINTER PARAMETER'' UNDER COM-LETE OR A/F'  
END
```

Example 4

```
/* EXAMPLE 'DPIEX1': DEFINE PRINTER INFOLINE  
*  
SET CONTROL 'XT' /* INFOLINE TOP  
SET CONTROL 'XI' /* SWITCH INFOLINE MODE  
DEFINE PRINTER (1) OUTPUT 'INFOLINE'  
WRITE (1) 'EXECUTING' *PROGRAM 'BY' *INIT-USER  
WRITE 'TEST OUTPUT'  
SET CONTROL 'XI' /* SWITCH BACK TO NORMAL  
END
```

```
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TEST OUTPUT

IO=814,AI =650,L=0 C= ,LS=80,P =3,PLS=80,PCS=24,FLD=90,CLS=5,ADA=22
```